

**IABC 2006
BIM PANEL DISCUSSION
3-3-06, DENVER, CO**

Charlie White

Welcome, your host today is Sigma Design. Sigma was founded in mid 1970's here in Denver and is one the first architectural CAD system that was ever developed. We have three products that we market at Sigma Design, ARRIS, of which we have very distinguished customers such as the people you will meet on our BIM Panel today.

1. ARRIS is a comprehensive CAD, 3D Modeling, Visualization and BIM System. For ARRIS customers the notion of the BIM is not a new concept. BIM is something that many of our customers have been doing for the past 20 years. Today, we are here to see if we can further define for ourselves what is meant by the term Building Information Model or BIM.
2. Sigma Design's second product, Builders CAD, is also a CAD, 3D Modeling, Visualization and BIM system. It is a "kissing cousin" of ARRIS, if you will. It is an extremely dialed in system for wood framing, panelization, and fabrication. In many ways Builders CAD is one of the most sophisticated building information modeling systems there is on the market.
3. Finally, our third product eZ is something that I believe is relevant to everybody in this room regardless of what CAD or BIM system you use. eZ is all about sketching and simple, interactive collaboration with all parties in the building process. I'm an architect who draws directly on his screen and I think every architect should be working this way. This new, but familiar skill set has fundamentally improved our design business over the past two years.

Our purpose today is, with the help of our distinguished panel, to try to further define what is BIM. Sigma Design is interested in developing world's best BIM system and before we get on with our solution, we want to, with your help, state the problem correctly. As any designer knows, if you can state the problem, then you're a long way onto the solution. Our distinguished panel today is truly a panel of experts. We have Mark Aycock of Wal-Mart. Wal-Mart is currently the largest customer of ARRIS in the world. Wal-Mart uses ARRIS to great effect in their store planning and design department. Everyday Wal-Mart is becoming more sophisticated and experienced at linking graphic information with important business information to improve their overall performance and decision-making. As far as we are concerned, Wal-Mart has been doing building information modeling for some time.

We also have Jonathan Smith from Lake/ Flato in San Antonio, a superb design firm that in 2004 won the national firm of the year for the AIA. They represent the highest standards of innovative design and architecture.

And we have Mike Polley of Harriman Associates, in Auburn, Maine. Harriman is the largest full service firm in Maine and I believe has been in business for over 130 years.

So BIM what is it? Why do I care? How do I do it?

There are three organizations that we feel are important to acknowledge in beginning our investigation and discussion on BIM.

The first of those is the International Alliance for Interoperability. This organization probably more than any other organization is trying to drive the adoption of BIM. They envision a world where it doesn't matter what software application you use on a project, it will work seamlessly with information created in other applications used on the project. IAI's vision and goal is to develop a standard universal framework to enable and encourage information sharing and interoperability throughout all phases of the entire design, construction and building life cycle. The IAI was founded in 1995, so they are 11 years into this mission so far. Again, the idea is that BIM will provide a universal format so that it will not matter if you're using ARRIS, Revit, MicroStation or Archi-CAD. A Revit model will be able to be opened up in ARRIS and the ARRIS user will be able to understand all of its geometry and information qualities. It's all about standards and it's all about everybody having the same standard.

The functional part of the IAI's mission is the IFC's, or Industry Foundation Classes. The IFC's specify and define common data structures for design elements and project information. For instance, there is a particular IFC which defines what a door is by defining fields which describe all of qualities of a door. The idea is that all the software developers will all adopt that same standard for defining a door. So once again when I look at a door in Archi-CAD it looks the same as in ARRIS. Our project information will be freed of the confusion and restrictions of proprietary formats, such as .dwg. The passing of information back and forth between various team members will be simplified and much more seamless. Again, there are various IFC's which have been developed to describe various building elements such as windows, doors, coverings, electrical outlets, etc.

This is a slide showing the IAI's diagram of how project information is currently shared between various team members on a design and construction project. All of us are very familiar with this diagram. It's called chaos, where everybody's working with different applications that don't communicate well together. The .pdf or .dwg format is as common a language or standard as we have in the industry. Both formats are not really adequate for the task at hand. The notion here is that it is a very inefficient way to work.

The next slide is IAI's view of the new world, the promise land if you will. In this diagram there is a commonly shared project model and all disciplines will be able to work seamlessly on that common model, regardless of software application. The architect will do his work, the electrical engineer will do his work, the structural engineer will do his work, and the facility manager will do his work. Because all applications on the project will conform to the IFC standards, there will be no requirement for translating information back and forth. Communication and collaboration will be more accurate and convenient. This is a bold and ambitious vision. I hope they win.

Another very important organization that is driving the adoption of BIM is the General Services Administration, or GSA. The GSA has created an initiative that ultimately will lead to, at some point, mandatory requirements for work to be produced in BIM applications. At least that is the goal. One day you will have to produce a building information model in order to work on their projects. The GSA defines BIM as follows: BIM is a 3D parametric modeling software, with an underlying database. Any changes made to the model or its documentation automatically update and coordinate everywhere.

The GSA has also come up with an adoption migration analysis diagram that represents various design firms and their different strategies for implementing BIM. The first firm is NBBJ. The diagram indicates that they began investigating this in 1995, and they planned to deploy BIM in 2001. You look down a little bit further on the list and you see Kling Architecture, Engineering and Interiors. They indicate that they planned to start investigating BIM in 2001, after their initial investigation, they plan to stop and wait for at least a year before taking any action. The GSA started their BIM initiative in 2003. At some point in 2006, the GSA is planning to release additional talking points and some planning points for the industry to rally around. On the website they list that they have 20 BIM projects and counting. Actually, earlier this morning, I talked to one of the lead architects at GSA, federal buildings director, Charles Matta, AIA, and he indicated it was more like 9 for the number of actual BIM projects. He and I had a very focused hour-long discussion on the GSA's thoughts and future directions. One point he stressed during our discussion is that in the GSA's vision of BIM, it must be software vendor independent. They do not want Autodesk to dominate the BIM world. They want it to be an open and free standard with architects and engineers free to choose whatever application they need to use. They do not intend to mandate a particular BIM application.

This next slide shows four of the major leaders for the BIM initiative within the GSA. They are architects Tom Graves, Charles Matta, Calvin Cam, and Steven Hagan.

The third important organization that is leading the drive for the adoption of BIM technology is the Technology and Architectural Practice committee of the AIA, or TAP.

If you look at the current Edges newsletter, you will see that there are nine articles listed in the table of contents. All nine articles are on the subject of BIM. I personally think they are going a little bit overboard, but obviously TAP believes that BIM is an important subject. While BIM is exciting and certainly important, I do believe that there are other significant technological subjects that the architectural profession needs to be exploring. I brought one of my favorite new technologies with me today. It is called eZ, and combined with my 21" Wacom Interactive Pen Display, which is a high resolution graphics monitor that gives me the ability to sketch directly on my computer screen. I think it is a technology that every architect needs to investigate. This simple technology is a major productivity and communication tool in our office. It is also a technology that anyone can use successfully. TAP really should be paying attention to subjects such as these as well as promoting their BIM initiative. However, it is clear that TAP is focused on BIM and they are doing a very good job of getting the word out. If you are not already a member of the TAP knowledge community, you should join up today.

Now onto the practical meaning of all of this:

Why BIM? Obviously, BIM is going to save or make somebody money. If it doesn't then it will never happen. In the end, I expect it is the building owner who should be the ultimate benefactor of this improved process. Folks, like the GSA.

Is BIM more work? Yes, although it potentially can save time during the construction and life cycle phase of a project. BIM is an additional step in detailed decision-making for a building project.

Who pays for BIM? Obviously, the owner is going to pay for BIM. Once again, it's going to have some payback to the owner or BIM will never be adopted.

BIM (Building Information Model): At Sigma Design we believe that the data model is as important as the 3D geometric model. We would slightly modify the GSA's definition for BIM to include intelligent 2D information as well as 3D parametric models.

Currently, the GSA's definition excludes the possibility that a project could be executed with 2D drawings and diagrams and still perform BIM functionality. We believe BIM is equally powerful in the 2D world. The data model is really what the 'I' in BIM represents. Our friends from Wal-Mart can speak to this process. They are already doing very sophisticated information extraction and analysis with their 2D drawings and diagrams. Currently, their needs as a business and facilities manager are being satisfied with this method. This is not to say 3D is bad, 3D is great. We are only saying it is not the only way to skin the BIM cat. BIM should be 3D or 2D or both.

An important reality of BIM is that garbage in is garbage out. Decisions must be accurate. There is nothing worse than misinformation. It is better to have no information than to have the wrong information because you and others will go down the wrong path.

That translates to waste of energy and effort. For BIM to be effective your decisions must be correct.

Does BIM require change? Absolutely. It is a completely different way of working. Mainly, it introduces more detailed decision-making earlier in the process. Also, that detailed decision-making needs to be maintained as the project goes forward.

Does BIM save money? Sometimes yes, sometimes no. From our perspective, it takes more time to do a quality BIM project. Many projects do not require 3D models or even intelligent 2D drawings. We don't need to take it to the level of detail because it's not necessary to execute the work. Some of the proponents of BIM sort of get carried away and it's all or nothing in regards to BIM. I contend that drawings and CAD are here to stay as a legitimate method for executing work. Architects will be hand drawing and making diagrams for centuries to come. This notion that if you don't BIM you're going to be obsolete; I don't completely buy into it. It may be that you can't do work with the GSA and maybe that is something you choose not to do, or if you are going to do work with the GSA, then you need to have a good BIM solution to work with them.

My formula for the design and building process is shown in the next slide. We always begin our process by gathering information from whatever resource we can find, particularly our client. We have found during this investigative phase that people's minds change as we attempt to state the problem. After gathering and researching as much as possible, we then go into a schematic design phase during which, we have also

found - people's minds change. We then progress to design development and people's minds continue to change. When we go to CD's peoples minds are still changing. This is not just the client, this is the architects, engineers, it's the whole team. For us, design is a very fluid process, always changing. Next comes the estimating and pricing process and then people start to really change their minds. Finally, we build our design. Even during this late stage in the process, people continue to change their minds. For me this is an important part of the equation because this could be trouble for a BIM project. Keeping up with this process requires time and resource to record it in a Building Information Model. How does that get paid for? How do you pay for the maintenance of the BIM as the building is modified and changed during its life cycle? People, like our company, are looking for these answers. For firms like ours, BIM definitely holds the potential to increase our mastery and profitability on our building projects.

Now, lets hear from our panel: Mark Aycock with Wal-Mart will give us a quick glance from 10,000 feet how he sees the meaning and potential for BIM: Mark,

Mark Aycock with Wal-Mart

I'm going to begin by saying that I'll be addressing BIM strictly from a data interoperability standpoint and not on the AEC industry as a whole. However, I think the concepts apply to both. I'd like to place more emphasis on the "I" in BIM than on the M. I feel like the software over the last 20 years or so for the most part have been developed to mimic the manual processes that they're replacing. I see this push towards BIM being driven by four factors:

1. Open communication channels due the Internet.
2. Mature and affordable hardware that anyone can obtain.
3. A need for greater collaboration across teams more instantly.
4. Increase in relational database technology.

These factors will allow more informed decisions to be made earlier in the process, but before this can happen the software and thus the user must have all the data that it will need readily available to them at any time. In my view we would like to define BIM as relational database plus CAD. Each phase in this process map shown represents data silos typically managed by their own pertinent technologies. I propose the in compassing circle represents a relational database accessible by all applications including CAD. It is a technology needed at each of these phases, the same technology, obviously not. It is specific to each function, however, accessed to the same data as required, which again includes CAD. Let's take a look at the macro level of this process. From a building stand- point, our new store construction document phase is pretty efficient. This is due to several things, first of all, communication being done for all projects across an extranet website so all parties have immediate access to information. This is also do to reliance on a relational databases to help control the flow and keep track of information at each exchange point shown here. Lastly, it is due to a tremendous amount of competition that exists in the retail industry today which drives us to be as efficient as possible. Finally, let's look at some tools that we use in our area of this process. We use a number of tools within our area to define the appropriate design for a store. We also exchange information with internal departments as well as outside consultants allowing them to rely their expertise to the process. Much of this exchange is electronic through a

database. However, in some cases the information must be recreated in each tool before work can begin. We see BIM providing a more seamless means of exchange information through IFC's and other means to eliminate this redundant work as well as expand data interoperability to CAD and beyond the process.

Mike Polley with Harriman

One of the things that happens at Harriman quite frequently is we will actually go out into the CAD market and invite vendors in to see what it is they do and what they provide and we test and evaluate, probably more often than Charlie would like us to. We will try projects and other products to see how they compare and stack up to what it is we do with ARRIS. One of the projects that we had a chance to do was based in Revit. We had a team of individuals that were really excited about the notion of the all in one database that would consume all the data. They were drawn by the whole idea that Revit was putting forward which was basically if you move a window it automatically moves everywhere else because it is only done once in the model. Its a "romantic" idea that makes you sit back and say to yourself "man this the way it's got to be, it's the only way it can be". What we found, however, was what is right with it is also what is not right with it. This project was an existing parking garage and what we were adding a medical office space on the upper level. A couple of things made this project right for testing on Revit.

1. It wasn't very big.
2. It had a long production schedule, so we didn't have to worry about using new CAD system and having a deadline putting pressures that were unrealistic on people at the time to make it successful.

In the initial stages of the project, it was going pretty well and the architecture was coming together, people were getting their models in, but as we were going along, in no time at all, the data grew to be 50 mb. The things that were good about it was that room, tags, doors, room boundaries based on where the walls were all basically automated and imbedded in the data structure which were kind of nice. What was going not so well, was the whole information modeling procedure. Revit basically uses one data file for the entire project. If you are going to take and have a production team you have to do something they call worksets. In worksets you basically outline what data parts will be for example: if you have the envelope as a workset, someone else could have the interior partitions as a workset, and so forth. In order to use those worksets, you have to actually load the entire project to your local PC, you save it to your local hard drive from the network save and you work from that copy of it. When you want to post your changes from the menu "save to central." The processes were starting to get quite cumbersome once the database got to be so large. It was actually very difficult for the team to manage. The other thing that was a challenge is that the associations have been made between elements. In Revit you can take and say the top of a partition is tied to the floor level, the thickness of the concrete and the floor deck is always going to remain three or four inches or whatever the project requires and if you move floor elevation it will drag the steel deck, beams, joist, and all those elements with it. If you move an outside wall in the envelope and you have those partitions attached to that outside wall, it would move the relation and it would extend that interior partition to meet. While with Revit, because you put that partition in a workset it doesn't belong to the exterior envelope, where you have another individual working, the lock says that you can't move certain things. These

were the main challenges with that project. Another challenge that we found was that as individuals were using it, there was reliance on having automated routines to create elements. If you are using AutoCAD or you are using MicroStation, or ARRIS you always have those base elements that are just lines and circles and you can represent a lot of work with lines and circles. They don't necessarily have any intelligence, but it gets the job done on the 2D drawings. With Revit, and an example I would use is: in the roof structure we had a rectangular building that had 3:1 aspect ratio in equipment. They have an automated routine and this is Version 7 so there's been new releases that may have fixed some of this. Then our automated routine that would basically automatically put in a plate that is the roof and if you specify a slope it would draw it in from end to end and across the length of that building the roof was pitching a total of two feet, which is absolutely absurd for the size. It was suggested to the person doing the training that we cut it up into three sections. While the routine that he had did not accommodate having two internal roof drains or three internal roof drains re-cut and cut into sections. It was very difficult for them to actually get that done, where as most people doing CAD at other levels, if you were using a 2D CAD package you would throw some lines on there and some pitch arrows and you would be done, but because you're doing a model that has that 3D representation it put extra burden on having those automated routines to actually get the project done. The project and the CAD package do not have those routines in it and you are kind of left out in la-la land a little bit. I have to say that he did figure out how to do it but it took him an hour in the training session. This is a detail that for the most part was generated by cutting the automatic sections. This is kind of one of the good things about what you can do with Revit. The majority of this detail was actually

generated automatically by cutting the section through the model. Insulation, sheet rock, window detail all of that was automatically generated, the noting and the text were basically put on afterward. In the way Revit works is pretty much every drawing that you can plot and send to a contractor is pretty much generated on the plot because it is a 3D model. The one thing that we had difficulty with is fudging it. You know when you are drawing a detail, sometimes you have to...I guess the example I would use is: see the flashing coming over the wood, it's not that far away from the wall, it is actually right on it and you draw in 2D off the wall for clarity so that people reading your documents can understand it. Revit does not like that. It likes to have everything exactly where it is. If you think about it in reverse logic, for a BIM model to be that precise that others could use it has to be that accurate. You are left with a conundrum based on what you do on your 2D detailing when you show things that are not quite real but you do it with clarity and with print, it's a very big challenge; to a point where the production team was very frustrated with this aspect of it. I do not believe that they have the equivalent of having a manual dimension in the system where you can just mention and say put some words in or fudge a number. Basically, that was our experience with it. As far as being productive on it we obviously were way over our production hours on it. From my perspective anytime you try something new you cannot expect it to be on top of the game. Though we did use it as a learning experience. The basic conclusion from the team was that our first experience with BIM was not a very productive experience. Or to put it more succinctly, our current ARRIS are still a more profitable way for us to produce our work. Harriman still wants to pursue BIM, but we do want to wait and let the tools mature a bit more.

To give you some background on Harriman. We are full service, we have been working with Shaw's Supermarkets in New England for 20 years and we were the holder of this standard and used to produce all of their CAD work in ARRIS. Everything from refrigeration to site plans, to all working documents from mechanical and electrical structural and so forth. More recent times, that chain was bought by Albertson's and we were faced with a decision. Albertson's was MicroStation house. They basically told us that you have done a lot of nice things but unless you produce our work in MicroStation you're not going to be able to do the work. We decided we would set a team up to use MicroStation. We do produce all of our Albertsons/Shaw stores on MicroStation, however we do not utilize the BIM aspects of MicroStation for these projects. They are still produced with traditional CAD methodologies. One of the things that I think is important in this whole process of looking at BIM and the information modeling is how does this whole process help my bottom line? Can we meet production hours with the work that were doing? Charlie's slide earlier addressed the idea that somebody has to pay for it if they want all that extra information. If you are going to save someone else some effort then the shift of who gets paid what has to happen. One of the things that I think is interesting is the notion of doing 3D models for the sake of coordination of trades, ductwork, piping and so forth. Not many people in our industry actually do that. You see it a lot in ship builders and so forth where restraints in time are a different scale. This is an example: I am the IT Manager, but I also do structural engineering, tailored toward the structural. There is a product out on the market called Rams Steel, our engineers use it extensively to engineer the beams and columns and so forth. Basically, what you do in Rams Steel is you draw the entire plan out with a lot of rigid rules that only could come

about because it is a structural engineer that wants it to be a certain way and when the product does calculations for beam sizing it doesn't want to make any mistakes, so it is very particular on how it is done. MicroStation does full BIM modeling and you have to produce it in 3D, but was really nice about this, I did not draw a single stroke within MicroStation it just read the raw data from Rams Steel and generated the model for me. As you can see the foundation walls came through, steel beams, frame, columns, the whole works came through and they were all properly sized and they were all connected. One of the things you can do in MicroStation that is similar to what you can do in Revit is you can draw cut sections from the model. MicroStation does a thing that they call context sensitive display. This is something that I think is a little bit of a leg up for MicroStation. You have basically a rules generator and you cut a section and you say I want to generate a framing plan and I want the columns to be shown on a certain layer and I want them to be a certain pen weight. I want the beams to be shown on their layer but I want the ends of the beams held back six inches and I want you to label them automatically and put the text basically over the center of the element so much distance away. Basically this framing plan is developed from a model that came from Rams Steel and the only button clicking I had to do was basically just say generate, I did not draw any of it. This is a definite production gain from BIM. Basically, through the design process when we do an ARRIS project we are a well-oiled machine. It's like the team gets on the bobsled at the top of the run and they get on and it comes out the other end, you meet deadlines that are very important. When you look at the Revit models it is very hard to add in a whole bunch of team members in the last week if you need to have that extra capacity. In this scenario, with reading in the Rams Steel model, it certainly saves

our engineers a lot of time and effort to get a base submission or 50% submission. A failing that I see in both which I think is important to address in any CAD package that comes up, is that both of the companies really push you to stay inside that 3D model right to the end. I think a product has to have a bail out point. When you're doing detailing, it's not always important that you model every aspect of that detail. I would use an example: I cut a section through the edge of the building with MicroStation, and it will draw all the components that have been modeled. Now, basically all I want to do on this detail is to add a clip angle at a certain point to receive the steel stud system. When you are in a 2D mode none of those 3D elements are available so you cannot add that clip angle to it because they want to force you to be working in the 3D model. From that aspect it's really important to me and we ran into the issue with Revit is that at some point you want to stop developing that 3D model, because all you are doing is finishing the job, crossing the t's and dotting the i's and that can be a challenge so I'm looking for bail out point in the 3D model to shift to 2D drawing.

Jonathan from Lake Flato

These other two folks have basically talked about BIM as production or facilities management tool and we are interested more in how it might impact our current design process. Quickly, I will touch on how we as an office basically operate, design, how we

are using what I call BIM lite right now in the office using two different programs to achieve that, and finally what we as a design firm would like to see BIM be able to do. Lake / Flato is 60 people in San Antonio, we are very design oriented and a lot of customization one off stuff, not a lot of repetition. We see that there is a lot of value in BIM with repeating things but when you are doing homes that alone have 60 different window types we start to wonder how we would be able to use BIM efficiently and how it would help us. Currently we are using a BIM lite aspect; I'm using it on a project I'm working on. I'm doing a whole lot of work early in Sketch Up. I'm taking my models and I'm doing them all in Sketch Up and I'm refining all the sizes and building the model in such a way so that all my pieces of the model update like they would in some of these programs these guys have talked about. I work in Sketch Up because it is real easy to work in, it's real simple, and it's fast.

Tape ended on side 1

Panel discussion:

Charlie: Who should own the building information model? Should the architect? Engineers? Or should the owner own it? We as architects are accustomed that we own our drawings and have copy right over them. Now the question is should the architect ultimately be the owner of the Building Information Model?

Mike: Has anyone had to take a test for the insurance provider for the liability policy the detect test? What did those guys say? Do not let them have it, because there is a liability line that gets crossed frequently.

Charlie: Don't let who have it?

Answer from Mike: Anybody else but the architect.

Charlie: The architect owns the BIM?

Mike: Right, it has to do with freely sharing drawing files, which has become expected in the industry today. It has to do with having things you made raw for representation purposes not technically accurate. An example I would use when we were doing steel framing plans is we have a beam directly above another beam we would draw them side beside and dimension it 0 inches. We would put the appropriate elevation marks on. If you hand that drawing out and you have a fabricated that is using some automated method to reading those drawings to have his fabrication process be faster and he sends that beam out and it shows up side by side then you have a liability issue.

Mark: In our current process we are involved in the building much later than the construction document phase. Currently, we are involved in the process almost before construction is done, so from our stand point information is needed much later than the construction document phase; to say that the architects own the model or any other entity on the team, if they own the building then they would have to continue the life cycle of that building and maintaining that information further into the process. Currently that's not going to be done as far as we can tell by any services that we do business with. It is very important for us that at some point in the process we are given that information where we can continue and develop that process for our purposes.

Jonathan: I don't have any thankfully any court cases that we've been involved in with this, but I think having the architect own it is an interesting possibility. As Mark said it would be really nice if there was some way you could offer the BIM model as some sort of additional service or a copy of it somehow. I don't know all the legal reasons around it and stuff that is associated with it. It would be a nice service to provide to a client, like

Mark was saying so that they have a model of everything that's in the building exactly as it is supposed to be and when they go to add on or move things around or add a new bathroom, they know exactly where everything is and they can assume it is a standardized system they then have this really powerful tool that they can use. I think that is an interesting question.

Charlie: I asked Charles Matta at GSA today what the GSA's opinion of who should own the building information model. The GSA is very definite about that the owner should own the building information model. The reason is that architects at this time aren't capable of maintaining that building information model, because it goes beyond getting the building designed and constructed. It has to do with the fact that building lives on and there are other specialties and other disciplines that come in and out that are going to need to access that building information model. The GSA believes that the owner will have to ultimately own that building information model. In our own real estate development business if we had paid for the building information model, we would absolutely expect that we were going to control that model and not be required to go back to a particular architect, for instance.

Someone in audience: As an owner would you expect that to be included in the current services that an architect provides or would you be willing to pay extra for that?

Charlie: If I had a financial benefit we would be willing to pay extra for it. Currently the GSA is paying extra incentives to create their building information models. They indicated that in the future they see BIM being rolled into the standard design fees. It will simply be a requirement on the project.

Mike: That's a good point Charlie. My perspective was from our design organization to the builders and in the end we always turn over our drawings to the owner.

Charlie: Is BIM strictly restricted to 3D information or should that definition be broadened to include 2D information as well?

Mike: I think from my perspective because of the nature of our work and our interaction with outside sources has a lot more to do with information not in the model, but it's also the data that's tied to that model, in fact, the beam on the slides was drawn to it's accurate size and you could potentially do an appearance checking with other disciplines and other trades. Also, automatic generation of things like doors, windows, schedule generation, material take off and all that stuff in many cases it's a lot more effort to input that information. I think that over time software vendors will solve that. I think the potential benefit for us centers around having better information about the building, the elements that are in the building, and the intelligence associated with those elements. For example knowing that a piece of equipment needs 120 bolts or it needs 240 bolts that kind of thing. That type of information is important to us.

Mark: I think in one of your slides you have the question, is BIM a 3D model or a data model? I would answer that question as yes, that it's both. It depends on the task at hand as to whether it's important to be a 3D model or a data model or both. I would suggest the data is much more important to our end of business, because we are coming into the process after the building is under construction and is being built. So from a data stand point we need to be able to capture data, we need to be able to assign data; to aspects of

the building even after the construction documents are completed. BIM work equally well with both 2D and 3D geometry. You should only have to use 3D geometry when the task at hand requires it.

Jonathan: I agree with Mark, it's not an either or, it's a both. You have the data and you have the 3D model, and again on our side being more of the design side, I think having that 3D model being easy to use and being there is really powerful as a design tool. I think from our standpoint we would really like to see that somehow fairly integral to the BIM.

Charlie: My next question for you guys is: Should the building information model be restricted to the IFC standards or should it be opened to other standards besides IFC? For instance the AIA is conducting a BIM competition. One of the requirements of the competition is that all work be IFC compliant. Should BIM be restricted to the International Foundation Classes? Mike, at Harriman on your Revit process did the IFC's ever come up during the process?

Mike: No, we never looked at it. Just in general practice, I wouldn't mind seeing a uniform standard on a lot of levels. For instance the AIA has come up with a layer structure. I wouldn't mind seeing something like that in our industry so that when your passing drawings back forth, even if you have to translate, it's a lot more common ground. One side of me says yes that would be great to have some standard, that way everybody knows what the rules of the road are and when a client or someone else makes an unreasonable request, then you have the basis to defend yourself. A lot of times, one of the things that we run into, if it's a facilities group that wants the information, they may want a layer structure that's different from what we produced for them. A facilities group

tends to look at that information and that data with a different set of glasses on. For them it's core, it's travel, it's all the things that are important to them for running that building. For us whether it's new or existing seems to be a big deal. In facilities everything is existing. They are trying to keep track of building elements. Creating a construction set is a different task.

Charlie: I would like to open it up now, the remaining few minutes to the audience and get some questions from the audience.

Ron Morris: I would like to see BIM lead to where you could take some type of projection device to the jobsite and with holographic images see where everything is to be installed. Now, that would be useful.

Charlie: There's a real test of the garbage in, garbage out theory isn't it. Anybody want to respond to that?

Mike: In the world that we live in, we still have to provide an insane amount of information and detail and it seems to contractors and builders, at least on the projects we deal with it, our projects range from 1 million dollar buildings to 50 million dollar buildings. Where they are 50,000 and 500,000 square feet of building. They are looking for a different level of information from us. The drawings I use to coordinate the effort because interference between one discipline and another may be a problem. You could see intellectually that down the road all this could be solved with the perfect 3D model. I don't think the industry is ready to receive it all today. So yeah, maybe your vision for the future is accurate when you all this new technology works better. But for right now, at the jobsite they are looking for that a beam is precisely 13 ft. 4 1/8 inches long over the span. They want to fabricate that beam so it's the right off site not at the site. Currently,

the detail that's required is telling him that there are four bolts on the connection and so many inches of weld and what size the weld is and so on. It could disappear with time, their actually using our drawings currently in fabrication shops to do that automated dimension feed to the systems, but they have to sign that lease.

I think drawings are going to remain diagrams for at least a little while longer. I think eventually, someday, in the perfect world, yeah, we'll get there, but it's going to be a little while. The difficulty on the job site now to getting them to read the 2D diagrams, so getting them to read the 3D models is going to be a bit more of a challenge.

Charlie: I have one question; with all this talk about absolutely accurate building information modeling and changing processes, what now becomes of the shop drawing industry? I don't know about your projects, but so many of our decisions are made ultimately at the shop drawing stage. Sometimes we make gesture to our intentions, because until a fabricator is chosen there is no reason for detailed drawings. How will BIM change that process? Is there not going to be the shop drawing industry anymore?

Unable to hear (someone talking from the audience)

Charlie: I think another important issue to resolve with BIM is how and who maintains the information as the building goes through its daily lifecycle? Already, our profession and the industry in general have real difficulty producing accurate 'as-built' drawings. It is definitely another leap to take that to accurate 3D modeling of the physical reality of the building plant. Maintain the changes that are happening everyday in that building is going to be a challenge. I don't doubt that the benefit is huge if you're able to do it.

However, it's all about how do we get from here to there. I think Salleh and Rob addressed that a little bit in saying that the IFC's are a good idea. They are a good

starting point. Their point was the IFC's are not enough. It relates to having the flexibility of being able to find things in a more customized way and not being too restricted by how a particular group of people define BIM standards.

Unable to hear (someone talking from the audience)

Charlie: Let me ask the audience again, because I know we have some Revit users are here, and I believe I saw a few ArchiCAD hands go up. How many of you using those products are actually doing building information modeling?

Unable to hear (someone talking from the audience)

Charlie: That's a great point that has not been brought out really. Some people are a little bit naïve in terms of understanding the incredible data sets that were talking about, if we are really going to virtually create these structures in three-dimensions. Anybody that currently does 3D modeling to any depth will have an appreciation for this aspect. Computers actually aren't ready to run this level of BIM yet.

Mike: There is something I would like to add. It relates to some comments that were made in the back. One of the things that always comes up is what information gets shared, what information is given out in a project, and it has more to do with the specific contract arrangements between parties. Whenever we get a request for information, it sounds like it's a liability waiting to happen. We tend to get a little bit stiff in the backbone. I think probably one of the tasks that these organizations have to do is address what are the contractual relations between an architect, a builder, and an owner. I think probably if they can scrutinize that and maybe relax some of those boundaries then maybe this thing will move forward. That's a huge issue and it doesn't really come up

when we start talking about all the warm and fuzzies about how everything should be. We have to remember that there are those areas.

Charlie: Again, I personally feel that for BIM to really take off it has to be freed of the constraints that must be a 3D model in order to be BIM. I'm going to go back to Wal-Mart. Wal-Mart is ultimately the owner that's going to get the benefit of all this to maintain their facilities and in talking with Wal-Mart, 3D might be good, but actually most of what Wal-Mart needs is just fine in 2D drawings. Am I correct Mark?

Mark: I would say that's correct. At least from my area of the business, there is other areas of the business that could benefit from 3D, but from our area of the business that we are focused on it's more about data and more about creating place holders for decisions that can be made later on in the process.

Charlie: Whether you see a column as a three dimensional geometric reality with intelligence tied to that or whether that column is simply a 2D representation with intelligence tied to it shouldn't matter. All we're saying is that the definition of BIM should be expanded to include 2D drawings and diagrams as well as 3D models.

Audience member: How are architects going to make this transition to BIM?

Jonathan: I think that's kind of generational thing, I think that newer folks in the office, I being one of them, are no longer really drawing, I'm working with a partner, he's drawing the section with elevation, I'm doing it all in 3D at the same time while he's doing his part. I think there needs to be a lot of flexibility for BIM to happen.

Charlie: With that thought, I'm going to go ahead and bring our panel discussion to a close. I really want to congratulate our panel, you've done an excellent job. Thank you Mark, Mike, and Jonathan. I have learned a lot today.

